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Magnetic and Transport Characteristics of  
Ferromagnet/Semi-conductor Multilayers R. P. Michel, A.  
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Recent publications indicate the presence of novel magnetic coupling of Fe layers separated by Si spacer layers. In order to clarify the nature of the magnetic coupling through an amorphous and possibly semiconducting spacer layer, we have prepared a variety of FM/SE multilayer systems with FM=Fe, Co and NiFe, and SE=Si and Ge, using ion beam sputtering. The magnetization of the multilayers was compared for different deposition conditions, and layer thicknesses. The magnetic characteristics were compared to structural information derived by modeling X-ray diffraction data. Of the three FMs used, we find the magnetization of Fe/Si MLs is closest to the predicted value for a perfect ML. In addition, the magnetoresistance of the multilayers in the current-perpendicular-to-plane (CPP) geometry were measured. The current-in-plane magnetoresistance is dominated by the anisotropic magnetoresistance of the metallic ferromagnetic layers because of the relatively lower conductivity of the semiconducting spacer. In the CPP geometry, however, equal current passes through all of the layers.

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